Section 12 - West Colorado River Basin
Water Quality

Tables

Section 12

West Colorado River Basin - Utah State Water Plan

Water Quality

12.1 Introduction

Passage of the Utah Water Pollution Control Act of 1953 ushered the state into maintaining high quality water resources. The Federal Water Pollution Control Act in 1972 brought about major changes, particularly in the wastewater treatment plant program.

The Utah Water Quality Board has adopted regulations and set water quality standards that are enforced statewide. Significant progress has been made since 1972 on improving water quality; however, there is still much to be accomplished.

The Governor of Utah issued an executive order in 1984 to prepare and implement a plan for the protection of groundwater. As a result, the Utah Department of Environmental Quality (DEQ) prepared and, after public comment, implemented the *Ground Water Quality Protection Strategy for the State of Utah*. The DEQ also issued a proposed strategy in 1997 to implement the Safe Drinking Act in Utah which contains some water quality regulations (see Section 11).

Good quality water is an indicator of a healthy, well-managed environment.

12.2 Setting [34, 48, 55]

Many smaller communities use individual family septic tanks. The majority of incorporated towns use lagoons. The communities with wastewater treatment facilities are listed in Table 12-1. Boulder and Cannonville are planning centralized wastewater treatment facilities in the near future.

Streams in the basin flow from areas considerably different from each other in geology, land use, vegetation, altitude and climate. Water quality is measurably affected by these differences. The kinds of minerals dissolved in water and affecting water quality are determined by rock and soil composition, climate, biological effects of plants and animals, and water management and use as the water flows downstream.

Table 12-2 shows electro-conductivity (EC) and total dissolved solids (TDS) values for selected streams within the West Colorado River Basin. Average values are all flow weighted.

When natural erosion levels are high, it is generally because of low densities of native vegetation, steep gradients and unstable substrates. This erosion contributes to sediment-loading, turbidity, concentration of trace elements, high biological oxygen demand and salinity. Accelerated erosion from man-caused sources compounds these same problems.

Sewage lagoons near Cannonville

Table 12-1 Wastewater Systems	
Facility	Type
SOUTHEAST DISTRICT HEALTH DEPARTMENT	
Carbon County	
Clear Creek	Drainfield
Columbia	Total Containment Lagoon
East Carbon	Total Containment Lagoon
Hiawatha	Total Containment Lagoon
Kenilworth	Total Containment Lagoon
Price River	Trickling Filter/Solids Contact
Scofield SSD	Drainfield
Soldier Creek Campground	Total Containment Lagoon
Emery County	
Castle Dale/Orangeville	Aerated Discharging Lagoon/ Slow Sand Filter
Cleveland	Total Containment Lagoon
Elmo	Total Containment Lagoon
Emery	Total Containment Lagoon
Ferron	Aerated Discharging Lagoon
Green River	Total Containment Lagoon
Hunter Power Plant	Total Containment Lagoon
Huntington	Aerated Discharging Lagoon/ Slow Sand Filter
Huntington Power Plant	Facultative Discharging Lagoon
Clawson	Total Containment Lagoon
SOUTHWEST DISTRICT HEALTH DEPARTMENT	
Garfield County	
Escalante	Total Containment Lagoon
Ticaboo	Total Containment Lagoon
Tropic	Total Containment Lagoon
CENTRAL UTAH DISTRICT HEALTH DEPARTMENT	
Sevier County	
Fish Lake	Total Containment Lagoon
Wayne County	
Hanksville	Total Containment Lagoon

Source: Department of Environmental Quality

Table 12-2
Surface Water Quality of Selected Streams

Stream Gage Number and Name	Electro Conductivity (Micromho/CM @ 25°C)			Total Dissolved Solids (mg/l)			No. of Samples
	Max.	Min.	Av.	Max.	Min.	Av.	EC/TDS
09309600 Fairview Tunnel near Fairview, Utah	420	150	272				44/
09310000 Gooseberry Creek near Scofield, Utah	550	120	289	146	90	113	124/4
09310500 Fish Creek above reservoir near Scofield, Utah	640	25	341	226	169	196	143/15
09310575 Boardinghouse Creek at mouth south of Scofield, Utah	560	235	307	312	155	182	20/17
09310700 Mud Creek at Scofield, Utah	1050	295	422	391	171	238	91/41
09311500 Price River near Scofield, Utah	353	298	328	203	175	191	13/5
09312600 White River below Tabbyune Creek near Soldier Summit, Utah	900	240	544	372	312	319	171/7
09312700 Beaver Creek near Soldier Summit, Utah	600	240	357	271	203	214	109/7
09312800 Willow Creek near Castle Gate, Utah	1360	360	667	510	410	446	153/2
09312900 Willow Creek at Castle Gate, Utah	1220	450	644	749	279	378	21/10
09313000 Price River near Heiner, Utah	930	265	447	584	188	253	50/22
09313950 Price River at Wellington, Utah	2940	864	1984	1780	612	1585	4/2
09313965 Coal Creek near Helper, Utah	1100	760	829	567	475	525	18/4
09313975 Soldier Creek below mine near Wellington, Utah	1190	500	639	634	353	399	31/15
09314250 Price River below Miller Creek near Wellington, Utah	5000	720	1318	3050	1020	1853	131/7
09314280 Desert Seep wash near Wellington, Utah	10400	1390	6361	5970	2200	5670	98/3
09314340 Grassy Trail Creek at Sunnyside, Utah	2450	510	700	1350	332	425	44/19
09314500 Price River at Woodside, Utah	7540	760	2489	7060	480	2078	966/807
09314600 Price River at mouth, near Green River, Utah	6770	3750	4273	6270	3040	3602	3/3
09315000 Green River at Green River, Utah	3240	7	679	3440	196	468	1284/1052
09316100 Floywash at Hwy Bridge 6&50 near Green River, Utah	3760	2080	3175	1930	1930	1930	13/1
09317919 Crandall Canyon at mouth near Huntington, Utah	580	375	445	304	229	250	20/10
09317920 Tie Fork Canyon near Huntington, Utah	580	410	454	259	185	239	17/5
09317997 Huntington Creek near Huntington, Utah	470	290	348	253	164	193	24/12
09319000 Ephraim Tunnel near Ephraim, Utah	390	200	274	125	125	125	42/1
09324000 Seely Creek near Orangeville, Utah	928	278	383	267	141	165	13/11

Table 12-2 (Continued)
Surface Water Quality of Selected Streams

Stream Gage Number and Name	Electro Conductivity (Micromho/CM @ 25°C)			Total Dissolved Solids (mg/l)			No. of Samples
	Max.	Min.	Av.	Max.	Min.	Av.	EC/TDS
09324200 Cottonwood Creek above Straight Canyon near Orangeville, Utah	660	470	576	341	299	321	12/3
09324500 Cottonwood Creek near Orangeville, Utah	1700	340	390	1170	200	227	100/88
09326500 Ferron Creek (Upper Station) near Ferron, Utah	920	340	424	331	217	227	185/7
09327550 Ferron Creek below Paradise Ranch near Clawson, Utah	6030	11	1134	5760	391	922	92/79
09328000 San Rafael River near Castle Dale, Utah	6900	600	1432	6010	2210	2542	112/7
09328100 San Rafael R. at San R. Bridge Campground near Castle Dale, Utah	7200	660	1593	6030	453	1759	103/83
09328500 San Rafael River near Green River, Utah	6270	56	1931	6430	416	1604	1318/878
09329050 Seven Mile Creek near Fish Lake, Utah	195	77	114	86	69	74	102/2
09329500 Fremont River near Fremont, Utah	380	190	198	270	115	123	5/5
09329900 Pine Creek near Bicknell, Utah	290	60	121				85/
09330000 Fremont River near Bicknell, Utah	650	105	485	365	317	337	95/3
09330210 Pleasant Creek near Caineville, Utah	1600	612	1026	712	448	613	21/3
09330230 Fremont River near Caineville, Utah	3060	320	670	3010	402	1145	172/14
09330410 Bull Creek near Hanksville, Utah	720	245	332	462	462	462	31/1
09330500 Muddy Creek near Emery, Utah	730	286	393	250	175	219	382/16
09331850 Convulsion Canyon near Emery, Utah	1360	690	943	796	417	517	10/8
09331900 Quitchupah Creek near Emery, Utah	4150	890	1727	2690	1160	1488	66/18
09331950 Christiansen Wash near Emery, Utah	5550	690	1753	4100	449	1387	82/34
09332100 Muddy Creek below I-70 near Emery, Utah	5370	580	1424	3450	673	1598	288/38
09332700 Muddy Creek at Delta mine near Hanksville, Utah	5890	870	1916	4500	694	1522	130/96
09332800 Muddy Creek at mouth near Hanksville, Utah	9200	1430	5013	6730	922	3879	68/66
09333500 Dirty Devil River above Poison Spring Well near Hanksville, Utah	5000	900	1804	3240	1500	2043	151/5
09337000 Pine Creek near Escalante, Utah	1140	3	334				135/
09337500 Escalante River near Escalante, Utah	4350	280	856	3240	456	865	142/6
09381900 Paria River at White House Ruins near Glen Canyon, Utah	2880	1060	1963	2770	786	1658	18/16

Source: EPA - SRORET

The Division of Water Quality (DWQ) is initiating a more formal water quality planning process called the Watershed Protection Approach. This will be a systematic effort to be carried over a five-year cycle which will cover an entire watershed and/or groundwater recharge area, and will incorporate all of the division's water quality programs. This will allow an intensified monitoring program and will fit the National Point Discharge Elimination System programs licensing cycle.

The DWQ is currently conducting an intensive study of the West Colorado River Basin surface water quality. The Watershed Protection Approach has as its goal the protection of the watershed through the efforts of stakeholders, those influential and interested parties throughout the watershed that can resolve water quality problems in the basin.


Non-point source pollution in Fremont Valley

12.3 Regulatory Organizations

Leadership in maintaining water quality rests with local governments, with assistance from state and federal regulatory agencies and programs.

12.3.1 Local

Towns, cities and counties have primary responsibilities for water quality within their respective entities. These responsibilities and authorities are contained in Titles 10, 11, 17, 19 and 73 of the *Utah Code Annotated*, 1953, amended.

The Board of Health also has certain responsibilities for the control of public waste water, water pollution, septic tank construction and installation, and vector (mosquito) control. These duties are carried out through their staff. The Southwest, Southeast and Central Utah Public Health departments and the Utah Department of Environmental Quality work together on related regulations and activities for the basin.

12.3.2 State [27, 40]

The DWQ is responsible to adopt, enforce and administer state and federal water quality regulations. This includes the Utah Water Quality Act and the federal Clean Water Act. They are charged to maintain acceptable levels of water quality for a growing population. Increasing numbers of people also bring more recreational activity with added potential for pollution to surface streams and reservoirs as well as groundwater. In addition, water quality agencies and water rights administrators will be required to correlate their activities to assure state standards are met.

The Clean Water Act gives responsibility to the DWQ for the enforcement of regulations dealing with point and non-point source discharges. The DWQ is responsible for administration of the National Pollutant Discharge Elimination Systems (NPDES). The DWQ is also responsible for implementing the non-point source pollution program, in conjunction with the Utah Department of Agriculture and Food.

Limits on loading rates of various pollutants are usually established by the state with consideration given to Environmental Protection Agency guidelines. Municipal wastewater treatment facilities and industries discharging pollutants into Utah waters are issued a Utah Pollutant Discharge

Elimination System (UPDES) permit. These permits are valid for five years and must be renewed with a reevaluation of pollutant limitations.

Enforcement of NPDES/UPDES permit requirements is accomplished by effluent monitoring programs supervised by DWQ. Currently, four wastewater facilities and 34 industries have discharge permits. See Table 12-3 for a list of permittees.

The DWQ developed a *Ground Water Quality Protection Strategy* for the state of Utah based on an executive order by the governor in 1984. Groundwater discharge permits are required for activities with the potential for pollution. The DWQ has also established classifications for surface water in Utah based on anticipated uses. To help control water quality, the streams and lakes are given beneficial use designations. These uses are: 1) Source for drinking water, 2) for swimming and indirect contact recreation, 3) stream/lake/wetland dependent fish and wildlife, and 4) agriculture. Table 12-4 shows the current water quality classes and other pertinent information for the water storage facilities. Table 12-5 shows the classification of streams.

The Utah Department of Agriculture and Food, Environmental Quality Section, and the state DWQ administer a non-point water pollution control and prevention program. This program is funded by Environmental Protection Agency grants and matching funds from state and local agencies and private sources. The program includes watershed management projects, surface water and groundwater monitoring, and information and education. Public information programs include newsletters, brochures, videos and slide shows. These are also extended to public schools and adult education.

12.3.3 Federal

Congress passed the federal Water Pollution Control Act in 1972 to establish regulatory programs to improve the quality of the nation's waters. The act was amended in 1977 and became known as the Clean Water Act (CWA). Additional amendments were made in 1987.

The CWA amendments provided regulations to deal with the growing national toxic water pollution problem and to further refine the Environmental Protection Agency's (EPA) enforcement priorities. The amendments substantially increased EPA's authority to enforce all water quality regulations associated with new federal mandates to clean up the nation's streams, rivers, reservoirs and lakes.

In the mid-1950s, the federal government began offering funding programs to state water pollution control agencies to help in the ongoing construction of wastewater facilities. These early grants provided funding to pay for 30 to 55 percent of the total construction costs. This source of funds, along with monies provided through the Utah Water Pollution Control Act, helped finance most wastewater treatment facilities. More than $2.5 million in EPA grants have been spent to construct or enlarge wastewater treatment and collection facilities in the West Colorado River Basin.

Federal public works expenditures drastically decreased by 1990 and most grant programs for construction and upgrades were eliminated. Today, federal wastewater treatment funding is only available through revolving loan programs administered by the Division of Water Quality. In the year 1997, about $2 million was spent for new construction in the West Colorado River Basin.

Federal standards for solid waste and hazardous material are set forth under the Comprehensive Environmental Response and Comprehensive Liability Act (CERCLA) and regulated by the EPA. Compliance is verified through local health department monitoring programs.

Table 12-3
Point Source Discharge Permits

Watershed	Facility	Receiving Water
Price River	Amax Coal-Castle Gate (Mine & Sed Ponds)	Sowbelly, Hardscrabble, Spring creeks & Price River
	Anadarko (Cockrell Oil)	Summit Creek
	Andalex Resources-Pinnacle (Mine & Sed Pond) (Price Airport)	Deadman Creek
	Andalex Resources-Wildcat (Sed Ponds)	Gordon Creek
	Castle Valley Resources (Sed Ponds)	Price River
	Coastal States Energy-Skyline Mine (Sed Pond)	Eccles Creek
	Cyprus-Blackhawk (Sed Ponds)	Willow Creek
	Cyprus-Plateau Mine (Mine & Sed Ponds)	Mudwater Creek
	Horizon Coal Mine	Price River
	Horse Canyon Mine (Mine & Sed Ponds)	Horse Canyon
	Mountain Coal (Sed Ponds)	Gordon Creek
	PacifiCorp-Carbon (Sed Ponds)	Price River
	Price WWTP	Price River
	Savage Industries - CV Spur (Beaver Creek Coal)	Ditch
	Soldier Creek Coal (Mine & Sed Ponds)	Soldier Creek
	Soldier Creek Coal - Dugout Canyon (Mine & Sed Ponds)	Dugout Creek
	Soldier Creek Coal - Load Out US6 (Sed Ponds)	Grassy Trail Creek
	Sunnyside Coal (Mine & Sed Ponds)	Grassy Trail Creek
	Sunnyside Cogeneration (Sed Ponds)	Grassy Trail & Icelander US Fuels
	US Fuels Morhland Mine (Mine & Town Tank)	Cedar & Huntington creeks
	White Oak Mining (Mine & Sed Ponds)	Eccles Creek
San Rafael River	Castledale Lagoons	Cottonwood Creek
	Co-op Mining-Bear/Trail (Mine & Sed Ponds)	Huntington Creek
	Ferron Lagoons	Ferron Creek
	Genwal Coal	Crandle Canyon/Huntington Creek
	Huntington Lagoons	Huntington Creek
	PacifiCorp-Trail Mountain Mine (Mine & Sed Ponds)	Cottonwood Creek
	PacifiCorp-Hunter Sed Ponds	Rock Canyon Creek
	PacifiCorp-Wilberg (Mine & Sed Ponds)	Grimes Wash
	PacifiCorp-Deer Creek (Mine & Sed Ponds)	Deer & Huntington creeks
	PacifiCorp-Des Bee Dove (Mine)	Grimes Wash
Muddy Creek	Consolidated Coal Lagoons	Quitchupah Creek
	Southern Utah Fuel (Mine & Sed Pond)	Quitchupah Creek
Fremont River	Brown Trout Farm FH	Irrigation Canal
	Road Creek FH - Loa	Irrigation Ditch to Spring Creek
	UDWR - Loa FH	Spring Creek
	UDWR - Egan FH	Pine Creek
Lake Powell	Andalex-Smokey Hollow (Mine)	Warm Creek

Source: Division of Water Quality

Table 12-4
Surface Storage Classifications

Name	Beneficial Use Classes*						Trophic Status
Carbon County							
Grassy Trail Creek Reservoir	1C		2B	3A		4	
Olsen Pond			2B		3B	4	
Scofield Reservoir	1C		2B	3A		4	M
Emery County							
Cleveland Reservoir			2B	3A		4	E
Electric Lake			2B	3A		4	M
Huntington Reservoir			2B	3A		4	M
Huntington North Reservoir		2A	2B		3B	4	M
Joes Valley Reservoir	1C	2A	2B	3A		4	O
Millsite Reservoir	1C	2A	2B	3A		4	M
Garfield County							
Barney Lake			2B	3A		4	H
Cyclone Lake			2B	3A		4	
Deer Lake			2B	3A		4	
Jacob’s Valley Reservoir			2B	3C	3D	4	M
Lower Bowns Reservoir			2B	3A		4	
North Creek Reservoir			2B	3A		4	
Oak Creek Reservoir (Upper Bowns)			2B	3A		4	
Pleasant Lake			2B	3A		4	
Posey Lake			2B	3A		4	M
Purple Lake			2B	3A		4	
Raft Lake			2B	3A		4	
Row Lake #3			2B	3A		4	
Row Lake #7			2B	3A		4	
Spectacle Reservoir			2B	3A		4	
West Deer Lake			2B	3A		4	
Wide Hollow Reservoir			2B	3A		4	M

Table 12-4 (Continued)
Surface Storage Classifications

Name	Beneficial Use Classes*					Trophic Status
Sanpete County						
Duck Fork Reservoir		2B	3A		4	O
Fairview Lakes	1C	2B	3A		4	O
Ferron Reservoir		2B	3A		4	O
Lower Gooseberry Reservoir	1C	2B	3A		4	M
Miller Flat Reservoir		2B	3A		4	M
Rolfson Reservoir		2B		3C	4	
Twin Lakes		2B	3A		4	
Willow Lake		2B	3A		4	
Sevier County						
Fish Lake		2B	3A		4	O
Forsyth Reservoir		2B	3A		4	E
Johnson Valley Reservoir		2B	3A		4	H
Sheep Valley Reservoir		2B	3A		4	M
Wayne County						
Blind Lake		2B	3A		4	
Cook Lake		2B	3A		4	M
Donkey Reservoir		2B	3A		4	M
Fish Creek Reservoir		2B	3A		4	H
Mill Meadow Reservoir		2B	3A		4	H
Raft Lake		2B	3A		4	

*See Table 12-5.
Trophic Status Index (TSI) refers to the nutrient status, biological production and morphological characteristics of the water.

TSI less than 40 = Oligotrophic or "O", TSI 40 to 50 = Mesotrophic or "M",
TSI 50-60 = Eutrophic or "E", TSI over 60 = Hypereutrophic or "H". The lower the index number, the better the water.

Source: Division of Water Quality

Table 12-5
Stream Classifications

Stream	Use Classifications					
Price River and tributaries, from confluence with Green River to Carbon Canal Diversion at Price City Golf Course.		2B			3C	4
Price River and tributaries, from Carbon Canal Diversion at Price City Golf Course to Price City Water Treatment Plant intake.		2B	3A			4
Price River and tributaries, from Price City Water Treatment Plant intake to headwaters.	1C	2B	3A			4
Grassy Trail Creek and tributaries, from Grassy Trail Creek Reservoir to headwaters.	1C	2B	3A			4
Range Creek and tributaries, from confluence with Green River to Range Creek Ranch.		2B			3C	4
Range Creek and tributaries, from Range Creek Ranch to headwaters.	1C	2B	3A			4
Rock Creek and tributaries, from confluence with Green River to headwaters.		2B	3A			4
Nine Mile Creek and tributaries, from confluence with Green River to headwaters.		2B	3A			4
Pariette Draw and tributaries, from confluence with Green River to headwaters.		2B		3B	3D	4
Willow Creek and tributaries (Uintah County), from confluence with Green River to headwaters.		2B	3A			4
Bitter Creek and tributaries, from White River to headwaters.		2B	3A			4
Green River and tributaries, from confluence with Colorado River to state line except as listed below:	1C	2B		3B		4
Thompson Creek and tributaries, from Interstate Highway 70 to headwaters.		2B			3C	4
San Rafael River and tributaries, from confluence with Green River to confluence with Ferron Creek.		2B			3C	4
Ferron Creek and tributaries, from confluence with San Rafael River to Millsite Reservoir.		2B			3C	4
Ferron Creek and tributaries, from Millsite Reservoir to headwaters.	1C	2B	3A			4

Table 12-5 (Continued)
Stream Classifications

Stream	Use Classifications				
Huntington Creek and tributaries, from confluence with Cottonwood Creek to Highway U-10 crossing.		2B		3C	4
Huntington Creek and tributaries, from Highway U-10 crossing to headwaters.	1C	2B	3A		4
Cottonwood Creek and tributaries, from confluence with Huntington Creek to Highway U-57 crossing.		2B		3C	4
Cottonwood Creek and tributaries, from Highway U-57 crossing to headwaters.	1C	2B	3A		4
Cottonwood Canal, Emery County.	1C	2B			4
Fremont River and tributaries, from confluence with Muddy Creek to Capitol Reef National Park.		2B		3C	4
Fremont River and tributaries, through Capitol Reef National Park to headwaters.	1C	2B	3A		4
Pleasant Creek and tributaries, from confluence with Fremont River to east boundary of Capitol Reef National Park.		2B		3C	
Pleasant Creek and tributaries, from east boundary of Capitol Reef National Park to headwaters.	1C	2B	3A		
Muddy Creek and tributaries, from confluence with Fremont River to Highway U-10 crossing.		2B		3C	4
Muddy Creek and tributaries, from Highway U-10 crossing to headwaters.		2B	3A		4
Quitchupah Creek and tributaries, from Highway U-10 crossing to headwaters.		2B	3A		4
Ivie Creek and tributaries, from Highway U-10 to headwaters.		2B	3A		4
Dirty Devil River and tributaries, from Lake Powell to Fremont River.		2B		3C	
Escalante River and tributaries, from Lake Powell to confluence with Boulder Creek		2B		3C	
Escalante River and tributaries, from confluence with Boulder Creek, including Boulder Creek, to headwaters.		2B	3A		4
Deer Creek and tributaries, from confluence with Boulder Creek to headwaters.		2B	3A		4

Table 12-5 (Continued)
Stream Classifications

Stream	Use Classification			
Paria River and tributaries, from state line to headwaters.	2B		3C	4
All tributaries to Lake Powell, except as listed separately.	2B	3B		4

Class 1 Culinary raw water source.
Class 1C Domestic use with prior treatment.
Class 2 Instream recreational use and aesthetics.
Class 2A Primary human contact-swimming.
Class 2B Secondary human contact-boating, wading etc.
Class 3 Instream use by aquatic wildlife.
Class 3A Habitat maintenance for cold water game fish, water-related wildlife and food chain organisms.
Class 3B Habitat maintenance for warm water game fish, water-related wildlife and food chain organisms.
Class 3C Habitat for non-game, water-related wildlife and food chain organism.
Class 3D Habitat for water fowl, shore birds, water-related wildlife, and food chain organisms.
Class 4 Agricultural-livestock and irrigation water.
Class 5 Great Salt Lake general use, primary and secondary human contact, water-related wildlife, and mineral extract.
Class 6 General use restricted and/or governed by environmental and health standards and limitations.

Source: Division of Water Quality

12.4 Water Quality Problems

The Utah Department of Environmental Quality, U. S. Geological Survey and others have reports and data on the water quality in the West Colorado River Basin.

Water quality problems caused by pollution from natural geologic conditions is almost impossible to control. This type of pollution becomes more evident as the high water quality in the upper watersheds decreases as the rivers and streams flow downstream.

Other sources of pollution include contaminants from man-caused non-point sources. Concerns have been expressed about contamination from sewer lagoons and dense concentrations of septic tanks. Concerns also exist about water treatment plant effluent contaminating the groundwater. Bacterial contamination can be a problem along with chemical pollution.

12.4.1 Surface Water Problems [56]

Monitoring - The Utah Division of Water Quality and Emery Water Conservancy District have initiated an intensive monitoring program on the San Rafael River drainage system. This program is designed to set the benchmark for further studies which will define sources of pollutants entering rivers in the area. Further studies of chemical and biological loadings will be done where parameters are in exceedence of state water quality standards. The approach is to determine where the problems are, quantify them, and then set out in a systematic approach to reduce them where possible. Where it is impossible to reduce certain exceedences in the state water quality standards, an analysis will be made to evaluate changing the beneficial use classifications to meet the “real world.”

A most important component in this effort is the involvement of the local private land owners. They know the problems better than anyone and probably have the best handle on how problems could be solved in their areas. In this regard, citizen advisory boards and steering committees will be established in the future which will give that very important local input to this process. The end result of this extensive effort will be a consensus of all parties as to what needs to be done and what can be done to have all rivers and streams in southeast Utah in compliance with state water quality standards.

Table 12-2, in addition to showing average, maximum, and minimum conductivity and total dissolved solids levels for the various rivers and streams in the study area, reveals a general trend in the Price, San Rafael and Dirty Devil river systems of good quality water high in the watershed and unsuitable water for either agriculture or municipal purposes near the confluence with the Colorado River.

Salinity - As early as 1924 during his fieldwork, Gilludy (1929, page 76) noted :

> “The water of both San Rafael and Muddy Rivers is sometimes so concentrated that even stock will not drink it, but this happens only during the hottest and driest periods.”

The Price, San Rafael and Dirty Devil rivers flow through areas where marine shales and sandstone are surface geologic formations and the source of the region’s soils. Deep percolation from agricultural lands such as through the Mancos shale saline soils and rocks can produce return flows having total dissolved solids levels approaching 4,000 milligrams per liter (mg/l).

The Bureau of Reclamation estimated in 1986 that 60 percent of the salt loading at the river mouths comes from the irrigation sector in the Price-San Rafael study units, mostly from water lost to deep percolation. Of this amount, about 70 percent originates from salt dissolution caused by deep percolation from agricultural lands, 28 percent from canal seepage, and 2 percent from stock pond seepage. The remaining salt load mostly originates with natural runoff in the desert rangeland area, with some coming from mountain runoff. In order to reduce the amount contributed by irrigated agriculture, higher irrigation efficiencies are recommended. Each acre-foot of water not returning to the system through deep percolation reduces the salt load to the Colorado River by 2.4 tons per year.

The USBR Salinity Control Price-San Rafael Unit would treat approximately 16,350 acres of farmland with gravity-pressure sprinkle irrigation, about 9,650 acres with pump pressure sprinkle systems, and 10,050 acres with improved surface irrigation systems. This project will reduce salt loading to the Colorado River by 161,000 tons per year (See Section 6.6).

Mining Impacts - The impact on the Price, San Rafael and Green rivers from anticipated mining was examined in 1986 by the USGS. It was estimated that mining activities augment the flow of the Price River by as much as 12.6 cfs downstream of Scofield Reservoir and increase the salinity in the river at that point from 10 to 97 percent. In the San Rafael River, mining activities augment the flow from 2.9 to 6.7 cfs at the river outlet and decrease the salinity from 5.3 percent in March to an increase of 0.6 percent in May. As a result of anticipated mining activities in the Price and San Rafael rivers, the salinity of the Green River is expected to increase about 0.8 percent and flow about 0.3 percent.

Sedimentation - A significant water quality problem in the Price and San Rafael rivers drainage is sedimentation. In the central Price River area, four of the seven surveyed reservoirs had lost about 30 percent of their original storage capacity because of sediment deposition. Estimates based on non-standard suspended-sediment samples indicates that the sediment discharge of Price River at Woodside during the 1970 water year was at least 1,400,000 tons. This amount of sediment would cover one square mile to a depth of about one foot. At least one-third of the 1,500 square miles of drainage area upstream from Price River at Woodside probably contributes little sediment to the Price River. The remaining area contributes about 0.8 acre-foot of sediment per square mile.

Aquaculture - Fish farms within the Fremont River Basin affect the water quality of downstream rivers. Runoff from fish farms in the form of concentrated nutrients and fish pathogens can complicate downstream water treatment, decrease impounded water quality and adversely affect fisheries. Downstream waters tend to have higher pH and biological oxygen demand. Point discharge permits for fish farms in the basin are listed back in Table 12-3.

Lake Water Quality - Water quality problems are described below for some of the West Colorado River Basin selected lakes and reservoirs: Cleveland, Electric Lake, Fairview #2, Fish Lake, Huntington, Lake Powell, and Scofield reservoirs. These are, with the exception of Lake Powell, all included on Utah's 303(d) list of water quality impaired water bodies.

The water quality of Cleveland Reservoir is very good. Its waters are considered to be moderately hard with $CaCO_3$ concentrations ranging from 111-126 mg/l. The only parameter outside state water quality standards for defined beneficial uses is occasionally phosphorus. Trophic State Index (TSI) values indicate the reservoir is eutrophic based on secchi depth and chlorophyll measurements, except for 1989 when the reservoir was classified at mesotrophic. During the summer the lake stratifies and has significantly lower dissolved oxygen concentrations in the lower layers.

Electric Lake has been classified as mesotrophic and oligotrophic, but in the latest classification was mesotrophic. The water quality of Electric Lake is good, but dissolved oxygen levels fall off rapidly below the thermocline at six to 11 meters to bottom levels of 1.6 mg/l. Occasionally pH levels rise above the wildlife standard of 9.0, which is not uncommon for lakes during period of high algal production near the surface during the daylight hours.

Good quality water fills Fairview Lake #2, a shallow lake high in the Price River Basin. However, it exceeds state water quality standards for beneficial uses in phosphorus, 36 mg/l measured in 1990, and pH, less than 3 measured in 1992. The latest survey showed the lake to be oligotrophic, but it has been classified as mesotrophic. While oxygen levels are adequate in summer months, fish kills are reported during the winter showing that there is significant biological oxygen demand in the reservoir.

Fish Lake is the largest natural mountain lake in Utah. It is on the Fish Lake Plateau (the sixth highest mountains in the state) and its water quality is good. The lake water is considered soft with a hardness concentration of approximately 46 mg/L ($CaCO_3$). The only parameter that exceeds state standards is phosphorus. Generally, total phosphorus levels have not exceeded the state phosphorus pollution indicator with the exception of a reading of 34.3 in 1989 when total phosphorus values exceeded the indicator throughout the water column. This typically oligotrophic lake was characterized as mesotrophic in that instance. Near the bottom of the lake, anoxic conditions have existed in the last two lake surveys. Since the retention period of the lake, 58.5 years, is so high, water quality problems which arise from pollutant loading could persist for many years.

Huntington Reservoir is a mesotrophic reservoir high in the Huntington Creek watershed with very good water quality. The only parameter that has exceeded state standards for beneficial use is phosphorus, 42 mg/l in the hypolimnion during June 1992.

Water quality in Lake Powell, one of the largest man-made reservoirs in the United States, is good. However, records indicate that some records within the lake have exceeded state standards in coliform counts and have had exceedences of selenium and mercury concentrations for wildlife. Federal and state studies are assessing and documenting the effect and hazard of heavy metals found in the food chain within the reservoir. One researcher indicated that in the early 1990s a striped bass from Lake Powell was tested that exceeded standards for selenium in the tissues for edible fish. Fish tested from Lake Powell tend to have heavy metals contamination similar to deep sea fish like tuna, 0.2 to 0.7 parts per million. The most recent classification of the reservoir showed it to be oligotrophic, but characterizations have ranged between mesotrophic and oligotrophic.

Scofield Reservoir is located high in the drainage of the Price River and has fair water quality. Water quality impairments have been observed with excesses of phosphorus and too little dissolved oxygen in the water column. The average concentrations of total phosphorus in the water column has usually exceeded the recommended phosphorus pollution indicator level with concentrations of up to 54 mg/l. A Phase I Clean Lakes 314 Study was completed in 1983 for Scofield Reservoir which indicated that the water quality of the reservoir was good by most standards. The latest studies of the reservoir have shown it to vary between hypereutrophic to mesotrophic (1990-1992). At times, dissolved oxygen levels have been low near the surface and dropped rapidly with no oxygen below a depth of 5 meters.

In the fall of 1991, Scofield Reservoir was treated for the removal of rough fish such as carp. Prior to treatment, one factor contributing to the increased eutrophication of the reservoir was the increase in the internal phosphorus loading to the reservoir from the resuspension of sediments by non-game fish. With the eradication of rough fish, the water quality of the lake seems to have improved.

12.4.2 Groundwater Quality Problems

Potential sources of groundwater pollution include those from agricultural operations, various types and methods of waste disposal, and operations such as mining and oil and gas exploration. See Section 19, Figure 19-3 for location of the groundwater reservoirs.

The protection of groundwater recharge areas for consolidated rock and alluvium are critical to water quality. In potential recharge areas where the aquifer is exposed, it can be contaminated by precipitation and streamflow leaching pollutants left in or on the land. Alluvial aquifers are especially vulnerable to pollution and, in some cases, the aquifers have already been adversely affected by the activities of people.

Groundwater is found in large areas in the West Colorado River Basin, but only a few reservoirs are suitable for municipal or agricultural uses. Groundwater quality in the upper watershed area in each drainage is suitable for either irrigation or municipal purposes. The water quality deteriorates in the mid and lower portions of the Price, San Rafael and Dirty Devil basins, due to the geology.

Aquifers intimately connected to surface recharge zones tend to be fresher than deeper, less connected aquifers. Deeper sandstone aquifers containing water trapped in storage for long periods of time and disconnected from the surface hydrologic cycle have mean salinities within a range of 6,200 milligrams per liter to 14,000 milligrams per liter of total dissolved solids.

In the northern San Rafael Swell area, the Navajo Sandstone is the shallowest, the most permeable, and contains the freshest water. Because of the proximity of saline aquifers below it as well as the poor quality surface water near the aquifer, large scale development of the Navajo sandstone aquifer is generally not practical.

12.5 Water Quality Needs

Man-caused pollution along with natural causes and recent and future growth and development will impact the water quality. The following ongoing water quality and monitoring programs are needed so the water resources can be adequately analyzed:

- Routine and intensive monitoring is needed. There may be locations where monitoring of exceptional events is needed.
- A detailed inventory of severely eroding watersheds is needed. This will provide a base for monitoring of best management practices (BMPs) applied to critical areas. Testing of surface water as well as groundwater is also needed to determine if and where nutrient (fertilizer) and/or pesticide contamination has occurred.

- Further studies and sampling are needed of lakes and reservoirs and of water quality near mines.
- Monitoring septic tanks and leaking underground storage tanks can determine whether they are causing contamination and to what extent.

In addition, riparian communities need to be re-established along parts of the river corridors where recreational impacts and grazing have destroyed the vegetation and compacted the soils. These impacts increase runoff which, in turn, increases salt and suspended solids in the streams. Many of the stream segments where riparian vegetation has been severely damaged are located in areas where there is accelerated erosion.

12.6 Alternative Solutions

Pollution caused by man's activities can be controlled or at least reduced. Landfill locations can be controlled by elected officials and government agencies working together. They should be located in areas where surface water or groundwater will not become contaminated through leaching or runoff. Controls on construction and other land surface disturbances will also reduce pollution.

Increasing irrigation efficiencies can go a long way toward reducing the leaching of chemicals out of the soil. Technology is available to help reduce this source of pollution. Nutrient management, hayland management, cropping sequence and waste utilization are good alternative solutions.

In some areas, domestic livestock and/or wildlife or other causes have depleted the land cover. Practices to re-establish vegetation will reduce erosion and the resulting pollution. In the case of federal Forest Service or BLM lands, best management practices (BMPs) will be implemented and grazing practices can be changed. Logging practices may require a buffer to protect streams.

All local government entities should work with state agencies in implementing local groundwater protection programs. Groundwater recharge areas should be identified, zoned and use controlled where there is danger of contamination.

The Environmental Protection Agency's Section 319 Nonpoint Source Pollution Control Program administered by the Division of Water Quality and carried out by the Utah Department of Agriculture can provide funds and technical assistance to reduce non-point pollution in critical watersheds. Controlling erosion and the resultant sediment production can reduce contamination of surface water flows. Where private land is involved the solution is the same. For example, if a particular private operation is contributing to elevated fecal coliform bacteria and nutrients into a river, this program could give financial assistance to provide constraint berms or cement manure bunkers to keep this waste from the river.

12.7 Policy Issues and Recommendations

The two issues are water quality monitoring and management throughout the basin and methane gas production in Carbon and Emery counties.

12.7.1 Groundwater Quality Monitoring

Issue - Groundwater quality should be more closely monitored in the West Colorado River Basin.

Discussion - The groundwater quality and its vulnerability is not well documented, making it difficult to monitor and measure possible changes. The impact of groundwater quality problems is likely to increase in the future. Increased long-term monitoring is imperative to manage the groundwater reservoirs. This will require an increase in program funding that should be shared at local, state and federal levels.

Recommendation - The divisions of Water Quality and Water Rights, in cooperation with the U. S. Geological Survey, should develop and carry out a groundwater quality monitoring program with assistance from local units of government.

12.7.2 Methane Gas Production from Extracted Coal-bed Saline Water

Issue - Saline water extracted from one aquifer and re-injected into another should be monitored.

Discussion - Coal-bed methane gas is being extracted by several entities in Emery and Carbon counties and may continue for several years. In this process, groundwater is extracted, collected and re-injected under high pressure into the deeper Navajo sandstone aquifer. The protection of groundwater quality within adjacent aquifers is critical. The results of that process on water quality are, for the most part, unknown. Local government has expressed the desire for the regulatory agencies which oversee the extraction of coal-bed methane to gather more data on the effects of this process.

Water monitoring wells and existing production wells could be used to identify the groundwater, its quality, and the effects of the extraction and re-injection into the deeper aquifers.

Recommendation - Communication, coordination and cooperation by and among DOGM, DEQ, DWRe, DWRi, gas companies, local water user groups, and other affected persons and entities should be encouraged for the benefit and protection of groundwater within the basin. ●